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A reappraisal of *Ptilotus aristatus* and *P. blackii* (Amaranthaceae)

D.E. Albrecht[a] *& T.R. Lally*[b]

[a] Northern Territory Herbarium, Department of Natural Resources, Environment, the Arts and Sport, P.O. Box 1120, Alice Springs, Northern Territory 0871.
E-mail: dave.albrecht@nt.gov.au

[b] Australian National Herbarium, Centre for Plant Biodiversity Research, G.P.O. Box 1600, Canberra, Australian Capital Territory 2601.
E-mail: Terena.Lally@csiro.au

Abstract

The taxonomy of *Ptilotus aristatus* Benl and the related *P. blackii* Benl is revised and their relationship to one another clarified. *Ptilotus aristatus* is here treated as comprising two subspecies, *P. aristatus* subsp. *aristatus* and *P. aristatus* subsp. *micranthus* Albr. & Lally, nom. et stat. nov. *Ptilotus aristatus* var. *eichlerianus* (Benl) Benl is synonymised under *P. aristatus* subsp. *aristatus,* and *P. aristatus* var. *exilis* Benl and *P. aristatus* var. *stenophyllus* Benl are synonymised under *P. aristatus* subsp. *micranthus* Albr. & Lally. The original circumscription of *P. blackii* is shown to be a mixed concept (including *P. aristatus* subsp. *aristatus*), and this taxon is redescribed. Keys to *P. blackii* and *P. aristatus*, and to the subspecies of *P. aristatus* are provided. Distribution maps of all recognised taxa are presented.

Key word: Amaranthaceae, *Ptilotus*, taxonomy, nomenclature.

Introduction

Recent taxonomic papers by Davis (2004; 2007; 2009), Bean (2008) and Lally (2008; 2009) signify a new era in the classification of *Ptilotus* R.Br. (Amaranthaceae), which up until the mid 1990's was dominated by the complex taxonomy of Gerhard Benl. Davis' work has focused on the genus in Western Australia, while Bean has considerably improved the taxonomy of eastern Australian species, relegating many of Benl's infraspecific taxa to synonymy, and Lally has treated taxa from both Western Australia and South Australia. Preparation of a treatment of *Ptilotus* for the forthcoming new edition of *Flora of South Australia* by the second author has prompted the reassessment of the infraspecific taxa of *P. aristatus* and the related *P. blackii*. Benl (1984) recognised four varieties in *P. aristatus*, a small pink-flowered perennial herb occurring in arid regions of the Northern Territory and South Australia. In this paper we recognise only two of Benl's infraspecific taxa and treat them at subspecific rather than varietal rank. We also discuss the confusion associated with the typification of *P. blackii* and misapplication of that name to plants in South Australia and the Northern Territory.

Materials and methods

This study is based on examination of populations in the field, glasshouse grown material, and herbarium specimens or digital images from AD, CANB, DNA, MEL and PERTH. Measurements were made from fresh specimens and herbarium material (rehydrated where required).

Terminology used here to describe the hairs follows that of Benl (1971), as translated by Burbidge (1972). The hairs are basically of the same type (simple) but vary in the degree to which lateral projections are produced at the septa between the primary cells.

The leaves of the taxa described here could be interpreted as petiolate, but are here treated as sessile. The leaf lamina extends and narrows to the leaf base, with no discernible petiole. This feature is also present in other *Ptilotus* species, e.g. *P. erubescens* Schltdl. and *P. seminudus* (J.M.Black) J.M.Black.

Taxonomy

Key to *Ptilotus aristatus* and *P. blackii*

1. Leaves drying dark green to blackish-green; thickened basal portion of tepals (externally, above perianth tube) forming a prominent glabrous keel; hairs on distal margin of keeled portion not distinct from those on remainder of tepal surface; Western Australia ..... ***P. blackii***

1: Leaves drying pale green or yellow-green; thickened basal portion of tepals (externally, above perianth tube) convex or keeled, glabrous or hairy; distal margin of thickened portion with a skirt of hairs that are shorter and denser than those on the remainder of tepal surface; Northern Territory, South Australia ..... ***P. aristatus***

Ptilotus aristatus Benl

Mitt. Bot. Staatssamml. München 4: 79 (1961). — **Holotype:** Northern Territory: Charlotte Waters just N of the Northern Territory–South Australia border and a little east of the railway line to Alice Springs, 27 May 1939, *R.A.Simpson s.n.* (AD 95836091).

Perennial or facultative annual *herb* to 40 cm high with stout taproot; stems striate, with sparse to dense, subverticillate or verticillate hairs to c. 2 mm long, often glabrescent. *Leaves* sessile, with sparse subverticillate or verticillate hairs to c. 2 mm long, hairs denser on new growth and in leaf axils, often glabrescent, green, drying pale green or yellowish-green; apices acuminate or mucronate, mucro to 1.5 mm long; basal leaves spathulate, obovate or rarely narrowly obovate, 12–110 mm long including the long attenuate base which is usually equal to or longer than upper wider portion, 3–30 mm wide; cauline leaves ovate, narrowly ovate, elliptic, obovate or narrowly obovate, 7–52 mm long, 1.3–16 mm wide. *Inflorescences* hemispherical, ovoid, or rarely obovoid or subcylindrical spikes, finally 12–60 mm long, 9–35 mm wide, up to 80-flowered. *Bract* 3.5–8.5 mm long including aristate apex to 3 mm long, with moderate to dense, nodose, subverticillate or verticillate hairs over external surface, hyaline or chartaceous, brown all over or midrib and apex only; *bracteoles* 4–8 mm long, including aristate apex to 3 mm long, with moderate to dense, subverticillate or verticillate hairs mostly confined to the midrib externally, hyaline, midrib brown. *Perianth* 7.5–17 mm long including a basal tube 1–2 mm long, pink to pinkish-purple. *Tepals* linear, concave, outer tepals 0.5–2.3 mm longer than inner, apical portion scarious, glabrous, apex erose, obtuse or truncate; outer surface of basal tube with dense, nodose, subverticillate or verticillate hairs to 1 mm long; outer tepal surface with a thickened basal portion immediately above the tube, convex and glabrous, or keeled and with very short simple or verticillate hairs to 0.2 mm long, or rarely glabrescent, the distal margin of the thickened basal portion with dense, subverticillate hairs to 4 mm long, forming an erect skirt, remainder of outer tepal surface (excluding glabrous apical portion) with sparse to moderately dense, nodose or subverticillate hairs to 5 mm long, shorter near apex and on tepal margins adjacent to thickened basal portion, with sparse to dense verticillate hairs to 0.8 mm long beneath; outer tepals glabrous inside; inner tepals with sparse to moderately dense crisped nodose hairs inside, attached to the margins near base, hairs extending to a quarter of tepal length. Fertile *stamens* 2 (rarely 3), filaments 2.5–6.5 mm long, dilated basally; *staminodes* 3, filaments often shorter than fertile stamens, dilated basally; *staminal cup* minute to indeterminable; *anthers* of fertile stamens 0.5–1.3 mm long, usually exerted to side of perianth at anthesis. *Ovary* stipitate, with sparse, nodose hairs adjacent to style, sometimes on both sides, rarely glabrous; *style* eccentric, 1.6–4 mm long, straight or sinuate.

Notes. *Ptilotus aristatus* is morphologically similar to *P. blackii*; see under the latter species for further discussion. Two subspecies are recognised.

Key to subspecies

1. Perianth > 10 mm long; longest hairs on outer tepals (2.5–) 3–5 mm long; bracts and bracteoles 5–8.5 mm long; style 3–4 mm long . . . . . ***P. aristatus*** subsp. ***aristatus***

1: Perianth 7.5–10 mm long; longest hairs on outer tepals to 2 (–2.5) mm long; bracts and bracteoles 3.5–5 mm long; style 1.6–2.2 mm long . . . ***P. aristatus*** subsp. ***micranthus***

Ptilotus aristatus Benl subsp. *aristatus*

Ptilotus aristatus Benl var. *aristatus*, J. Adelaide Bot. Gard. 1: 204 (1979).

Ptilotus eichlerianus Benl, Mitt. Bot. Staatssamml. München 7: 310 (1970). — *P. aristatus* var. *eichlerianus* (Benl) Benl & H.Eichler, Muelleria 5: 259 (1984). — **Holotype:** South Australia: c. 14 km north of Eringa Homestead (Eringa Homestead is c. 155 km NNW of Oodnadatta), 11 Sept. 1966, *E.A.Shaw 490* (M n.v.). **Isotype:** AD 96642224.

Ptilotus blackii auct. non Benl: Benl, J. Adelaide Bot. Gard. 1: 204 (1979), pro parte; Benl in Jessop (ed.), Fl. Cent. Austral. 81 (1981), pro parte; Benl in Jessop & Toelken (eds), Fl. S. Austral. ed. 4, 1: 324 (1986), pro parte.

Illustration. G.Benl, Trans. Roy. Soc. South Australia 88: 54, fig. 1 (1964), as *Ptilotus blackii*.

Basal *leaves* 12–110 mm long including long attenuate base, 4–25 mm wide; cauline leaves 10–52 mm long, 2–14 mm wide. *Inflorescences* 10–60 mm long, 20–35 mm wide. *Bract* 5–8.5 mm long, some with brownish coloration extending beyond midvein; *bracteoles* 6–8 mm long. *Perianth* (10–) 12–17.5 mm long; outer tepals longer than inner by 1–2.3 mm, the outer surface with hairs to 5 mm long, thickened basal portion convex and glabrous, distal margin of thickened portion with hairs 2–4 mm long. Fertile *staminal* filaments 4–6.5 mm long; *style* (3–) 3.2–4 mm long.

Distribution and habitat. Ptilotus aristatus subsp. *aristatus* occurs in the Northern Territory near the South Australian border and extends into South Australia as far south as Evelyn Downs station (Fig. 1). Most collections have been made in the Stony Plains bioregion with a few records coming from adjacent areas within the Finke and Simpson-Strzelecki Dunefields bioregions. This subspecies typically occurs in open vegetation on gibber plains or slopes with loam- or clay-textured soils (rarely with sandy surface veneer), sometimes extending into adjacent floodouts. *Badman 5887* (AD) was apparently collected from a sandplain, which is considered an atypical habitat for the subspecies.

Notes. As defined here, *P. aristatus* subsp. *aristatus* includes specimens previously referred to *P. aristatus* var. *aristatus* and *P. aristatus* var. *eichlerianus*, and specimens from South Australia and the Northern Territory (but not Western Australia) previously referred to *P. blackii*. The principal numeric characters used by Benl to distinguish *P. aristatus* var. *aristatus* and *P. aristatus* var. *eichlerianus*, i.e. inflorescence width and perianth length, are unreliable due to continuous variation. Furthermore, inflorescence shape appears to be strongly influenced by developmental stage. In

reducing *P. eichlerianu*s to *P. aristatus* var. *eichlerianus* Benl (1984) himself acknowledged intermediate forms between it and var. *aristatus*.

Ptilotus aristatus subsp. *aristatus* differs from subsp. *micranthus* by its longer perianths, bracts, bracteoles and styles. It also has a glabrous, convex, thickened basal portion on the outer tepals, whereas in subsp. *micranthus* the thickened basal portion is usually hairy and keeled.

Conservation status. Placing *P. aristatus* var. *aristatus* and var. *eichlerianus* in synonymy under *P. aristatus* subsp. *aristatus* does not impact on the conservation status of the taxon in the Northern Territory. The Near Threatened coding (sensu IUCN 2001) for the varieties (Albrecht et al. 2007) under the *Territory Parks and Wildlife Conservation Act 2000* is also appropriate for *P. aristatus* subsp. *aristatus*. In South Australia, however, where *P. aristatus* var. *aristatus* is given Rare status and *P. aristatus* var. *eichlerianus* Vulnerable status (National Parks and Wildlife Council 2003), Rare would seem to be the appropriate code in South Australia for the redefined *P. aristatus* subsp. *aristatus*.

Selected specimens examined

Northern Territory. Mt Grundy, 12 Nov. 1993, *D.E.Albrecht 5654* (AD, DNA, NT); Eastern boundary of Finke River flood plain, near western boundary of Simpson Desert, 24 Apr. 1977, *G.C.Cornwall 316* (AD); Mt Wilyunpa, 20 Aug. 1992, *H.Coulson* 39 & *P.K.Latz* (NT); c. 3.5 km from NT-SA border on Finke-Mt Dare Rd, 4 Sept. 1997, *P.Horsfall 409* (NT); Andado Stn, 18 Apr. 1977, *P.K.Latz 6852* (AD, CANB, MEL, NT, PERTH); 2 km SE of 10 mile Dam, New Crown Station, 3 Feb. 1983, *P.K.Latz 9443* (NT); Andado Stn, 16 Aug. 1974, *A.S.Mitchell 101* (CANB, NT).

South Australia. Abminga Creek, 14 May 2001, *R.Bates 58592A* (AD, CANB); Pedirka, c. 65 km S of NT border on railway to Alice Springs, 29 Aug. 1932, *E.H.Ising 2966* (AD); 12 km W of Dalhousie Springs, 29 Aug. 2004, *P.K.Latz 20362* (MEL, NT); c. 10 km N of Hamilton Homestead, 8 Sept. 1987, *G.Leach 1404* (AD, NSW, NT); 1 mile [1.6 km] S of Mt Sarah, c. 60 km NNW of Oodnadatta, 8 Aug. 1963, *T.R.N.Lothian 1388* (AD, NT); Headwaters of Arrabunda Creek, 23 Sept. 1974, *D.E.Symon 9235* (AD, CANB, NT); Dalhousie – near Oodnadatta, 21 July 1921, *S.A.White s.n.* (AD).

Ptilotus aristatus subsp. *micranthus* Albr. & Lally, *nom. et stat. nov.*

Based on: *Ptilotus aristatus* var. *exilis* Benl, Muelleria 5(4): 258 (1984). — **Holotype:** Northern Territory: 54 miles [86.4 km] NW of Alice Springs, 3 May 1962, *G.Chippendale 8799* (M n.v.). **Isotypes:** AD 96349063, CANB 126984, DNA A8799, NSW n.v.

Ptilotus aristatus var. *stenophyllu*s Benl, J. Adelaide Bot. Gard. 1: 204 (1979). — **Holotype:** Northern Territory: Mt Hay, Milton Park, 23 Oct. 1974, *G.Griffin s.n.* (CANB 254681). **Isotype:** DNA A43463.

Illustration. W.Dobbie & C.O'Malley, Centralian Land Management Association and Threatened Species Network, Alice Springs. Colour photos 1–6 (2000).

Basal *leaves* 12–95 (–110) mm long including long attenuate base, 3–25 (–30) mm wide; cauline leaves

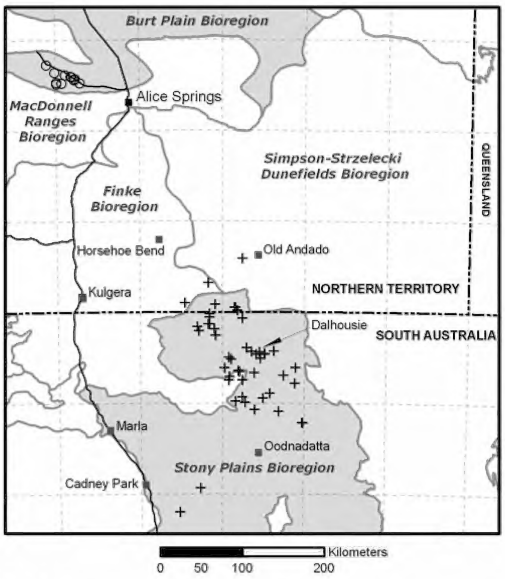

Fig. 1. Distribution of ***Ptilotus aristatus*** subsp. ***aristatus*** (cross) and ***Ptilotus aristatus*** subsp. ***micranthus*** (open circle).

9–50 mm long, 1.3–16 mm wide. *Inflorescences* 10–36 (–50) mm long, 9–22 mm wide. *Bract* 3.5–5 mm long, with brownish coloration confined to midvein; *bracteoles* 3.5–5 mm long. *Perianth* 7.5–10 mm long; outer tepals longer than inner by 0.5–1 mm, the outer surface with hairs to 2(–2.5) mm long, thickened basal portion keeled, hairy or rarely glabrescent, distal margin of thickened portion with hairs 1–1.7 mm long. Fertile *staminal* filaments 2.5–4 mm long; *style* 1.6–2.2 mm long.

Distribution and habitat. *Ptilotus aristatus* subsp. *micranthus* is endemic to the Northern Territory where it is restricted to a relatively small area within the Burt Plain bioregion about 100 km WNW of Alice Springs (Fig. 1). It has a patchy distribution over approximately 65 km^2 of cracking clay plain, principally on Amburla station, with a small proportion on Hamilton Downs station (Dobbie & O'Malley 2000). Populations occur within the Undippa land system (Perry *et al*. 1962), characterised by red coarse structured clay soils (sometimes with surface gravel) supporting grassland dominated by *Astrebla pectinata*, *Eragrostis xerophila* and *E. setifolia*.

Notes. Leaf width appears to be the primary character on which Benl (1984) based his separation of *P. aristatus* var. *stenophyllus* and var. *exilis*. Field observations have shown leaf width to be a highly variable character, with ranges of 4–27 mm being recorded for flowering plants in several populations. Furthermore, cultivated plants exhibit variation in leaf width that appears to be

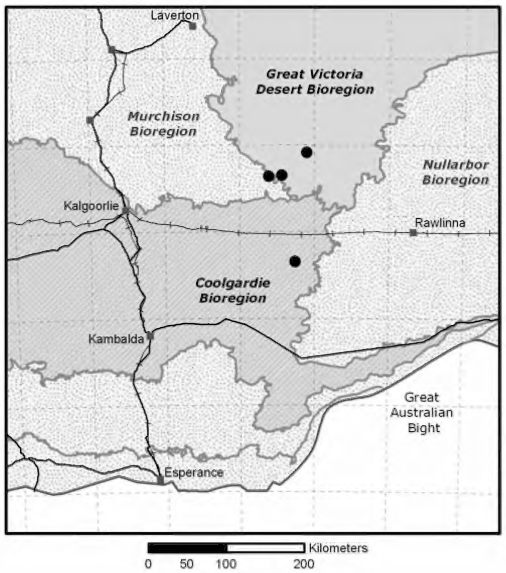

Fig. 2. Distribution of ***Ptilotus blackii*** (closed circle).

correlated with plant age. Young plants have broader early basal leaves that wither and disappear as plants age. Given the observed continuous variation in leaf width and absence of floral differences between the two varieties, their separation is considered untenable. They are here combined under the new epithet subsp. *micranthus*. We have recognised the taxon at subspecies rank given the significant morphological distinctions and geographical separation from *P. aristatus* subsp. *aristatus*.

The new epithet "*micranthus*" is preferred over Benl's earlier names, as it better conveys the distinguishing features of this taxon. We have chosen to base the new name on *P. aristatus* var. *exilis,* as the type material of that name is more representative and complete, as basal leaves are included.

An aberrant collection (*Collins 124*) from east of Amburla Creek is considered unusual in having exceptionally large inflorescences to 110 mm long and 25 mm wide, with widely spaced flowers basally, longer tepals (to 11.5 mm long) and a longer style (to 2.6 mm long). Glasshouse grown plants from a seed voucher of this collection were typical for *P. aristatus* subsp. *micranthus.*

Seeds sown in a glasshouse at the Alice Springs Desert Park in July 2008 flowered within three months of germination. Plants in the field flower and fruit at any time of the year in response to adequate rainfall.

Ptilotus aristatus subsp. *micranthus* is easily distinguished from subsp. *aristatus* by its shorter perianths, bracts, bracteoles, stamens and styles. It also has a usually hairy, keeled, thickened basal portion on the tepals, and shorter (to 2 (–2.5) mm long) hairs on the remainder of the tepal (to 5 mm long in subsp. *aristatus*).

*Conservation status***.** Placing *P. aristatus* var. *stenophyllus* and var. *exilis* in synonymy under *P. aristatus* subsp. *micranthus* does not impact on the conservation status of the taxon. The Near Threatened coding (sensu IUCN 2001) for the varieties (Albrecht *et al*. 2007) under the *Territory Parks and Wildlife Conservation Act 2000* is also appropriate for *P. aristatus* subsp. *micranthus*.

Etymology. The Greek epithet *micranthus* refers to its smaller flowers (perianths).

Selected specimens examined

Northern Territory. 7 km W of Mt Hay trig, 10 June 2000, *D.E.Albrecht 9545* (NT); Amburla Creek, W of Alice Springs, 23 Feb. 1978, *G.Benl 48, J.Maconochie & L.Ulyatt* (CANB, M); 3 km E of Amburla Creek, Tanami Road, 19 Mar. 2002, *T.L.Collins 124* (NT); c. 67 km W of Stuart Highway on road to Yuendumu, 27 Feb. 1991, *H.Coulson & L.Todd s.n.* (NT); c. 5 km S of Amburla Homestead, between Valley Bore and Mt Hay Bore, 31 Aug. 2006, *I.D.Fox 4054* (NT); Tanami Highway, 57.6 km W of Stuart Hwy, 25 Apr. 1988, *G.Leach 1851 & M.J.Barritt* (CANB, NT); Milton Park, 12 Dec. 1973, *C.Lendon s.n.* (NT); 95 km NW of Alice Springs, Tanami Hwy, 29 Mar. 1993, *D.J.Nelson 2867* (NT); 14 km NW of Hamilton Downs Homestead, CSIRO exclosure plot, 10 Mar. 1997, *M.White 51* (NT).

Ptilotus blackii Benl

Trans. & Proc. Roy. Soc. S. Australia 88: 53 (1964). — **Holotype:** Western Australia: Great Victoria Desert, W.A.; Camp 57 – c. 220 km east-north-east of Kalgoorlie, c. 260 km north-east of Lake Lefroy, 20 Sept.1891, *R.Helms s.n.* (AD 96216157). **Isotypes:** AD 96215164, MEL 2217620 n.v. (digital image at CANB), MEL 2217621 n.v. (digital image at CANB).

Perennial or facultative annual *herb* to 30 cm high with taproot; stems striate, glabrous or with scattered verticillate hairs to c. 0.6 mm long (denser on younger growth). *Leaves* sessile, with sparse subverticillate or verticillate hairs to c. 1.2 mm long, hairs denser on new growth and in leaf axils, usually glabrescent, green, drying dark green or blackish-green; apices obtuse or acute, ± mucronate, when present mucro to 1.2 mm long; basal leaves obovate or rarely narrowly obovate, 50–70 mm long including the long attenuate base which is usually equal to or longer than upper wider portion, 5–12 mm wide; cauline leaves narrowly ovate, obovate or elliptic 10–33 mm long, 2.2–8 mm wide. *Inflorescences* ovoid or ± hemispherical spikes, finally 12–20 mm long, 10–25 mm wide, up to 25-flowered. *Bract* 7.3–9.5 mm long including aristate apex to 2 mm long, with sparse to moderately dense, subverticillate hairs over external surface, hyaline or chartaceous, brown all over or midrib and apex only; *bracteoles* 7.8–9 mm long, including aristate apex to 2.5 mm long, with moderately dense, subverticillate hairs mostly confined to the midrib externally, hyaline, midrib brown. *Perianth* 11–14 mm long including a basal tube 1–1.5 mm long,

pink or purple. *Tepals* linear, concave, strongly keeled at base above tube, outer tepals 0.7–1 mm longer than inner, apical portion scarious, glabrous, apex erose, obtuse or acute; outer surface of basal tube with dense, subverticillate or verticillate hairs to 0.7 mm long; keeled portion above tube glabrous, remainder of outer tepal surface (excluding glabrous apical portion) with sparse to moderately dense, nodose or subverticillate hairs to 6 mm long, shortening near apex, with sparse to dense verticillate hairs to 0.8 mm long beneath, and along margins of basal keeled portion; outer tepals glabrous inside; inner tepals with moderately dense wavy nodose hairs inside, attached to the margins near base, hairs extending to a third of tepal length. Fertile *stamens* 2, filaments 4.5–6.5 mm long, dilated basally; *staminodes* 3, filaments slightly shorter than fertile stamens, dilated basally; *staminal cup* minute to indeterminable; *anthers* of fertile stamens 0.5–1.2 mm long, sometimes exerted to side of perianth at anthesis. *Ovary* stipitate, with sparse, verticillate hairs adjacent to style, sometimes on both sides; *style* eccentric, 3–4.1 mm long, straight.

Distribution and habitat. Ptilotus blackii is endemic to arid Western Australia, where it is currently known from a few localities near the south western edge of the Great Victoria Desert bioregion and a single location in the Coolgardie bioregion (Fig. 2). It occurs approximately 200 km east of Kalgoorlie, north and south of the trans-Australia railway line. It is recorded as growing in brown clayey sand or orange sand on flat plains in association with mallee woodland over spinifex.

Notes. Benl (1964) chose a Helms collection from Western Australia as the holotype of *P. blackii*. However, as noted by Benl, this material is immature, and therefore Benl also included a number of paratypes (representing mature plants) from South Australia to supplement his description of *P. blackii*. Unfortunately, the paratypes do not represent *P. blackii s. str.*, and are referable to *P. aristatus* subsp. *aristatus*. Benl's description therefore encompasses elements of both *P. blackii* and (mostly) *P. aristatus* subsp. *aristatus*. Despite the immature nature of the holotype material, this collection is distinguishable from related species (see below) on vegetative characters, and mature collections matching the holotype are known from the same geographical area in Western Australia. The comprehensive description provided here is based on all known collections of *P. blackii.*

The correct application of the name *P. blackii* has been problematic for some time, mainly as a result of Benl's mixed concept of the taxon. Benl variously determined specimens of *P. aristatus s.l.* from the Northern Territory and South Australia as either *P. aristatus* or *P. blackii*, although the basis for this distinction remains unclear. *Ptilotus blackii* is similar to *P. aristatus* subsp. *aristatus,* particularly with respect to habit, and the indumentum, colour and apex of the bracts and bracteoles. However, it differs in its glabrous mature stems (young stems may have some scattered hairs), leaves which dry dark green or blackish-green and the uniform hairs on the tepals. *Ptilotus blackii* also frequently has divaricate branchlets towards the top of the plant, shorter, narrower leaves, shorter inflorescences, shorter perianths and slightly larger bracts and bracteoles than *P. aristatus* subsp. *aristatus*.

Ptilotus blackii may also be confused with *P. nobilis* subsp. *nobilis*, the distribution of which overlaps that of *P. blackii*. However, *P. nobilis* subsp. *nobilis* is easily distinguished by its taller, more robust habit, basal leaves without long attenuate bases, cauline leaves usually with crenate, undulate margins, usually cylindrical inflorescences that are much longer and wider, and its longer perianths (15–44 mm long).

Conservation status. With its more restricted circumscription and few collections, *P. blackii* has recently been listed as Priority Three under the Department of Environment and Conservation (DEC) Conservation Codes for Western Australian Flora (Smith 2010). It is known to occur in the Queen Victoria Spring Nature Reserve, but requires further survey to determine its overall distribution and abundance.

Specimens examined

Western Australia. c. 127 km N of Balladonia along Zanthus-Balladonia road, *R.Davis 10596*, 23 Sept. 2003 (PERTH); Track from transline, 72.4 km N of Plumridge Lake, *R.Davis 10605*, 24 Sept. 2003 (NT, PERTH); 7 km SW of Nippon Junction, Queen Victoria Springs Nature Reserve, *D.J.Pearson 92*, 26 Nov. 1986 (PERTH).

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